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# मानक

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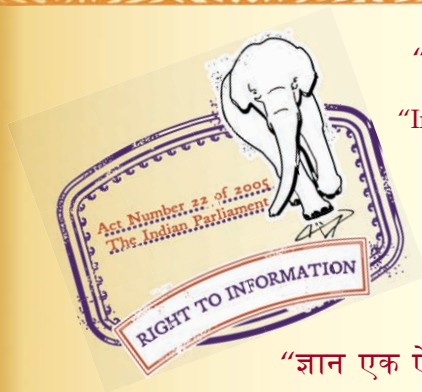
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IS 9002-13-3 (1985): Equipment for Environmental Tests for Electronic and Electrical Items, Part 13: Equipment for Change of Temperature Test, Section 3: Two Baths [LITD 1: Environmental Testing Procedure]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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IS : 9002 ( Part 13/Sec 3 ) • 1985

*Indian Standard*

SPECIFICATION FOR  
EQUIPMENT FOR ENVIRONMENTAL  
TESTS FOR ELECTRONIC AND  
ELECTRICAL ITEMS

PART 13 EQUIPMENT FOR CHANGE OF TEMPERATURE TEST

Section: 3 Two Baths

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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# *Indian Standard*

## SPECIFICATION FOR EQUIPMENT FOR ENVIRONMENTAL TESTS FOR ELECTRONIC AND ELECTRICAL ITEMS

### PART 13 EQUIPMENT FOR CHANGE OF TEMPERATURE TEST

#### Section 3 Two Baths

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*Indian Standard*  
**SPECIFICATION FOR  
EQUIPMENT FOR ENVIRONMENTAL  
TESTS FOR ELECTRONIC AND  
ELECTRICAL ITEMS**

**PART 13 EQUIPMENT FOR CHANGE OF TEMPERATURE TEST**

**Section 3 Two Baths**

**0. F O R E W O R D**

**0.1** This Indian Standard ( Part 13/Sec 3 ) was adopted by the Indian Standards Institution on 27 June 1985, after the draft finalized by the Environmental Testing Procedures Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

**0.2** The object of this standard ( Part 13/Sec 3 ) is primarily to guide the environmental equipment manufacturers with respect to broad specifications for their equipment and to assist the users of such equipment to properly define the requirements in the indent for the equipment. The requirements of the equipment largely depend on the environmental conditions to be simulated or created. It is expected that this standard will harmonise the requirements of the equipment produced by different manufacturers.

**0.3** The change of temperature test may be carried out by one of the three equipment systems ( as suitable ) given below:

- a) Two chambers [ for rapid change of temperature ( thermal shock ) test — *see* Section 1 of IS : 9000 ( Part 14 )-1978\* ],
- b) One chamber [ for change of temperature ( temperature cycling ) test — *see* Section 2 of IS : 9000 ( Part 14 )-1978\* ], and
- c) Two baths [ for rapid change of temperature ( thermal shock ) test — *see* Section 3 of IS : 9000 ( Part 14 )-1978\* ].

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\*Basic environmental testing procedures for electronic and electrical items: Part 14 Change of temperature.

**0.3.1** This standard ( Part 13/Sec 3 ) deals with two-baths system. The other types of equipment systems are being covered in Sections 1 and 2 of this standard.

**0.4** Certain requirements have been specified in a general form in view of practical difficulties in defining such requirements quantitatively. It is presumed that with the experience gained, more precise requirements will be laid down for such equipment.

**0.5** An overall performance assessment of the complete equipment for a short duration has been included although it may be realised that it may not be entirely sufficient. This will at least ensure the functional performance and operatability of the equipment. Many of the constructional requirements specified can be checked through visual examination.

**0.6** In view of the subjective nature of some of the requirements, sufficient care shall be taken in using the standard.

**0.7** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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## **1. SCOPE**

**1.1** This standard ( Part 13/Sec 3 ) lays down guiding requirements for the design and manufacture of liquid bath for conducting the change of temperature [ rapid change of temperature ( thermal shock ) ] test in accordance with Section 3 of IS : 9000 ( Part 14 )-1978†.

## **2. TERMINOLOGY**

**2.1** For the purpose of this standard, the definitions and explanation of terms given in IS : 9000 ( Part 1 )-1977‡ shall apply.

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\*Rules for rounding off numerical values ( revised ).

†Basic environmental testing procedures for electronic and electrical items: Part 14 Change of temperature.

‡Basic environmental testing procedures for electronic and electrical items: Part 1 General.



### 3. EQUIPMENT CHARACTERISTICS

#### 3.1 General

**3.1.1** The equipment namely liquid bath shall basically consist of one cold bath and one hot bath.

**3.1.2** One or two transfer baskets shall be provided to transfer the items under test from one bath to another by either electrical or pneumatic means.

#### 3.2 Temperature

**3.2.1** The hot and cold baths shall be capable of maintaining temperatures as follows:

- a) Cold bath : From ambient to  $-70^{\circ}\text{C}$
- b) Hot bath : From ambient to  $+200^{\circ}\text{C}$

**3.2.2** The hot and cold baths shall be capable of maintaining the set temperature within  $\pm 2^{\circ}\text{C}$  and  $\pm 3^{\circ}\text{C}$  respectively under steady state conditions.

**3.2.3** When the transfer basket with the test item moves from hot bath to cold bath or vice-versa the temperature inside the bath shall attain the set value  $\pm 2^{\circ}\text{C}$  after a time not more than 10 percent of the specified exposure time ( dwell time ).

**3.3 Dwell Time** — The dwell times of the transfer tray in cold and hot baths shall be controllable from 15 seconds to 10 hours by means of suitable timers.

**3.4 Transfer Time** — The time taken for automatic transfer of the basket between the hot and cold baths shall be controllable from 2 seconds to 10 seconds by means of a suitable timer.

**3.5 Test Specimen Capacity** — The equipment shall be capable of maintaining the specified temperatures in the cold and hot baths with specified transfer time with a test specimen of 0.7 kg of steel placed in the transfer basket.

**3.6 Dimensions** — The preferred sizes shall be selected from the following:

**3.6.1 Transfer Basket** ( preferably cylindrical ) — 100 mm dia, 100 mm depth.

**3.6.2 Bath** —  $350 \times 300 \times 300$  mm  
( length ) ( breadth ) ( height )

#### 4. TEST FLUIDS

**4.1** The following fluids are considered suitable for the hot and cold baths:

a) *Hot bath*

Phenylmethyl silicone	up to 200°C
Fluorinated organic compound FC 70	up to 200°C
Fluorinated organic compound FC 40	up to 150°C
Water	up to 95°C

b) *Cold bath*

Phenylmethyl silicone	up to -65°C
Ethyl alcohol ( $C_2H_5 OH$ )	up to -65°C
Fluorinated organic compound FC 77	up to -65°C
Water	up to 0°C

#### 5. CONSTRUCTION, WORKMANSHIP AND FINISH

**5.1** The two baths shall be made of highly polished stainless steel continuously welded and liquid tight and preferably be cylindrical in size.

**5.2** The two baths shall be located next to each other at a convenient working height.

**5.3** The exterior of the equipment shall be fabricated of heavy gauge cold rolled steel and suitably painted to prevent corrosion.

**5.4** Access to equipment requiring service shall be provided on both the front and back by means of hinged or removable access panels.

**5.5** The entire system shall be mounted on a rigid steel base frame and furnished with four swivel casters.

**5.6** A hinged plexiglass hood complete with suitable hardware and seals shall be provided over the area of the two baths to minimize the loss of evaporating liquid during normal operation.

**5.7 Insulation** — Each tank ( bath ) shall be insulated with heavy density fibre glass applied in sufficient thickness to minimize the heat transfer and reduce external condensation.

**5.8 Liquid Agitation** — In order to provide a uniform temperature throughout each bath, the liquid shall be continuously circulated using totally enclosed vapour sealed pumps capable of withstanding the extreme hot and cold temperatures. In the case of smaller baths a propeller mixer in each bath may be sufficient to maintain temperature uniformity.

**5.9 Refrigeration System** — The refrigeration system for the low temperature bath shall preferably be a mechanical refrigeration system with aircooled or water cooled two stage cascade refrigeration systems.

**5.10 Heating System** — The high temperature bath shall be heated by suitable heaters. The heaters shall be interlocked with the agitation system in such a way as to protect the equipment against a potential high temperature condition as a result of loss of liquid flow.

**5.11 Workmanship** — Workmanship shall be of good current engineering practice.

**5.12 Finish** — The external and internal finish of the equipment shall be done so as to ensure protection against corrosion and other similar effects.

**5.13 Miscellaneous** — All electronic, electrical, mechanical and electromechanical parts shall conform to relevant Indian Standard, wherever applicable.

## **6. INSTRUMENT CONSOLE**

**6.1** The equipment shall be provided with an instrument console which shall include the following:

- a) Indicating panel comprising mains on-off switch, mains on indicator, temperature on-off switch, and indicating lamps for refrigeration and heating circuits, manual/automatic control switches;
- b) Adjustable automatic timers to indicate dwell times and transfer time;
- c) Solid state electronic controllers and temperature indicators with digital display;
- d) Programmable cycle counter to count and indicate the number of hot and cold cycles;
- e) An indicator lamp to show that the programmed cycle has been completed and that the complete system is down; and
- f) A two channel strip chart or circular chart recorder for recording hot and cold bath temperatures.

**6.2** A programmable microprocessor controlled temperature controller which can combine most of the above functions shall be preferable.

## **7. POWER SUPPLY REQUIREMENTS**

**7.1** The equipment shall be capable of operating from an ac supply of 50 Hz either from single phase 240 V,  $\pm 10$  percent or three phase 415 V,  $\pm 10$  percent. The total power supply input shall be declared by the manufacturer.

## **8. SAFETY**

**8.1** Adequate electrical safety arrangements shall be incorporated in the equipment design to avoid electric shock to personnel and damage to the equipment.

**8.2** Over heat protection and low temperature cut-out shall be provided.

## **9. MARKING**

**9.1** The equipment shall be marked with the following information:

- a) Manufacturer's name or trade-mark,
- b) Basket and bath size,
- c) Temperature range, and
- d) Any other additional marking as required.

**9.1.1** The equipment may also be marked with the ISI Certification Mark.

**NOTE** — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

## **10. TESTS**

**10.1** The equipment shall be subjected to the following tests:

- a) Visual examination and inspections, and
- b) Performance.

**10.2** The equipment shall be subjected to performance run with the following conditions:

	<i>Max</i>
Hot bath	: specified temperature
	<i>Min</i>
Cold bath	: specified temperature
Test condition 1	: Dwell time 5 minutes, Transfer time 3 seconds
Test condition 2	: Dwell time 15 seconds, Transfer time 2 seconds
Number of cycles	: 100 for each test condition

## **11. INSTRUCTION MANUAL**

**11.1** Each equipment shall be supplied with instruction manual which shall contain the following:

- a) Operating maintenance and service instructions,
- b) Schematic and actual circuit diagrams; and
- c) List of components and spare parts.

## **12. INFORMATION TO BE FURNISHED BY THE INDENTOR**

**12.1** The following information shall be supplied by the indentor:

- a) Temperature limits for hot and cold baths ( *see 3.2.1* );
- b) Dimensions of the transfer basket and bath ( *see 3.6* );
- c) Test specimen capacity in equivalent kg of steel ( *see 3.5* ); and
- d) No. of transfer baskets desired, one or two ( *see 3.1.2* ).

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